

**REMARKS**

Entry of the foregoing, re-examination and reconsideration of the subject matter identified in caption, as amended, pursuant to and consistent with 37 C.F.R. § 1.111, and in light of the remarks which follow, are respectfully requested.

Claim 1 has been amended to further define the polyethylene wax by the softening point, the penetration hardness, a ratio ( $M_z/M_w$ ) and a density. These amendments are supported by the disclosure, for example, page 9, lines 3-5 and 10-12, and original claim 2. Claims 2 and 3 have been amended to be consistent with the amendments to claim 1. Claims 5-9 have been canceled without prejudice or disclaimer. No new matter has been added.

Upon entry of the Amendment, claims 1-4 will be all the claims pending in the application.

**I. Priority Claim**

Applicants note that the Office Action Summary is silent regarding Applicants' priority claim. The Notice of Acceptance of Application under 37 U.S.C. § 371 and 37 C.F.R. § 1.495 dated March 21, 2006, indicates that the priority documents have been received in the U.S. Patent and Trademark Office. Accordingly, the Examiner is respectfully requested to acknowledge Applicants' priority claim and confirm receipt of the priority documents in the next official communication.

**II. Drawings**

Applicants note that the Office Action Summary is silent regarding the drawings (2 sheets) filed with the application on December 22, 2005. The Examiner is respectfully requested to acknowledge acceptance of the drawings in the next official communication.

**III. Response to Rejection under 35 U.S.C. § 103(a)**

Claims 1-9 were rejected under 35 U.S.C. § 103(a) as being unpatentable over US Patent Application Publication 2003/0171481 to Toyoda. Applicants respectfully submit that claims 1-4 as amended are patentable over Toyoda for at least the following reasons.

Independent claim 1 recites a polyethylene wax defined by the following features (i) to (vi): (i) said polyethylene wax is an ethylene homopolymer or a copolymer of ethylene and at least one olefin selected from  $\alpha$ -olefins of 3 to 20 carbon atoms, (ii) a ratio ( $M_w/M_n$ ) of the weight-average molecular weight ( $M_w$ ) to the number-average molecular weight ( $M_n$ ), as measured by gel permeation chromatography (GPC), is in the range of 1.7 to 4.0, (iii) the softening point is not higher than 105°C, (iv) the penetration hardness is not more than 10 dmm, (v) a ratio ( $M_z/M_w$ ) of a z-average molecular weight ( $M_z$ ) to a weight-average molecular weight ( $M_w$ ), as measured by gel permeation chromatography (GPC), of 1.5 to 2.0, and (vi) a density of 880 to 910 kg/m<sup>3</sup>.

Toyoda discloses a polyolefin wax which includes an ethylene (co)polymer having a number-average molecular weight within the range of from 400 to 5000 as measured by gel permeation chromatography. The polyolefin wax has a volume average particle diameter in the range of from 0.3  $\mu\text{m}$  to 20  $\mu\text{m}$  wherein the relation between a particle diameter a ( $\mu\text{m}$ ), in which the weight ratio of the large particle diameter side in weight particle-size distribution is 10%, and a particle diameter b ( $\mu\text{m}$ ), in which the weight ratio of the small particle diameter side in weight particle size distribution is 10%, satisfies the  $a/b \leq 4$  and the relation between the crystallization temperature  $T_c$  (°C), measured at a cooling rate of 2 °C/min) as measured by differential scanning calorimetry (DSC) and the density D (kg/m<sup>3</sup>) as measured by the density gradient tube method satisfies the equation  $0.501 \times D - 366 \geq T_c$  (Abstract).

Applicants submit herewith a Declaration under 37 C.F.R. § 1.132 by Mr. Mai Kurihara. The Declaration demonstrates that the polyethylene waxes described in Toyoda don't satisfy all the requirements recited in present claim 1.

Specifically, in the Declaration, WAX a1 having the lowest ethylene content and WAX a3 having the highest ethylene-content of the ethylene waxes in Table Ia of Toyoda were used, because the properties of the ethylene wax depend on the ethylene-content. The properties of WAX a1 and WAX a3 were measured in the same manner as described in Examples of the present specification, and the results are shown in the following Table, together with the results of Examples 1-4 and Comparative Examples 1-2 described in the present specification:

Table

	Examples				Comp. Ex.		TOYODA	
	1	2	3	4	1	2	WAX a1	WAX a3
[ $\eta$ ] (dl·g <sup>-1</sup> )	0.24	0.39	0.22	0.36	0.24	0.36	0.22	0.22
Mw/Mn	3.1	3.6	2.9	3.0	2.3	3.6	3.2	3.2
Mz/Mw	1.6	1.7	1.6	1.6	1.6	<b>3.3</b>	1.7	1.9
Density (kg·m <sup>-3</sup> )	902	895	903	882	901	906	<b>920</b>	<b>977</b>
Softening point (°C)	98	93	103	91	94	104	<b>109</b>	<b>135</b>
Penetration hardness (dmm)	6	7	5	10	<b>13</b>	6	2	1
Shrinkage ratio (%)	0.70	0.34	0.82	0.25	<b>1.32</b>	<b>1.08</b>	<b>2.13</b>	<b>6.06</b>

As shown in the above table, the polyethylene waxes of Toyoda don't meet the softening point (iii) and the density (vi) recitations of present claim 1, thereby having very

high shrinkage ratios (2.13% and 6.06%, respectively). On the other hand, Examples 1-4 according to the presently claimed invention demonstrated low shrinkage ratios (0.25% to 0.82%), and a good balance between shrinkage ratio and hardness. As such, these waxes can be favorably used for a hot melt, a lost wax and the like, and can form a model for precision casting (see descriptions at page 9, lines 3-9; page 9, line 22 to page 10, line 3; and page 65, lines 8-21 in the present specification).

Toyoda does not disclose or suggest all the features recited in present claim 1, or the above noted effects which can be achieved in the presently claimed invention.

In view of the foregoing, Applicants respectfully submit that claim 1 is patentable over Toyoda and thus the rejection should be withdrawn. Additionally, claims 2-4 depend from claim 1 and thus are patentable over the cited reference at least by virtue of their dependency.

#### IV. Conclusion

From the foregoing, further and favorable action in the form of a Notice of Allowance is believed to be next in order and such action is earnestly solicited. If there are any questions concerning this paper or the application in general, the Examiner is invited to telephone the undersigned at his earliest convenience.

Respectfully submitted,

BUCHANAN INGERSOLL & ROONEY PC

Date: August 14, 2009

By: \_\_\_\_\_



Fang Liu, Ph.D.

Registration No. 51283

P.O. Box 1404  
Alexandria, VA 22313-1404  
703 836 6620